

Baumann et al.
Serial No. 10/755,632
Filed: 1/12/2004

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

What is claimed is:

1. (Previously presented) A finstock comprising:
an aluminum alloy comprised of about 0.7-1.2% Si, greater than 2.0 to about 2.4% Fe, about 0.6-1.0% Mn, up to about 0.5% Mg, up to about 2.5% Zn, up to about 0.10% Ti, and up to about 0.05% In, with the remainder comprising Al and tolerable Impurities, wherein the aluminum alloy when cast into an alloy strip and reduced by cold rolling produces a finstock that is substantially free of breakage.
2. (Original) The finstock of claim 1 wherein said tolerable impurities comprise at least one of the following:
up to about 0.2% Cu, up to about 0.2% Zr, up to about 0.05% Cr and up to about 0.3% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.4%.
3. (Original) The finstock of claim 2 wherein said tolerable impurities are comprised of up to about 0.05% Cu, up to about 0.05% Zr, up to about 0.05% Cr and up to about 0.05% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.10%.
4. (Previously presented) The finstock of claim 2 wherein said aluminum alloy is comprised of about 0.8-1.1% Si, greater than 2.0 to about 2.2% Fe, about 0.6-0.8% Mn, up to about 1.5% Zn, up to about 0.2% Mg, up to about 0.05% Ti, and up to about 0.03% In.

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5. (Original) The finstock of claim 4 wherein said tolerable impurities are comprised of up to about 0.05% Cu, up to about 0.05% Zr, up to about 0.05% Cr and up to about 0.05% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.10%.

6. (Original) The finstock of claim 1 including a post-braze electrical conductivity of greater than about 48%IACS.

7. (Original) The finstock of claim 6 wherein said post-braze electrical conductivity is greater than about 50%IACS.

8. (Original) The finstock of claim 6 including a post-braze Ultimate Tensile Strength of greater than about 120MPa.

9. (Original) The finstock of claim 8 wherein said post-braze ultimate tensile strength is greater than about 130MPa.

10. (Previously presented) A fin for a heat exchanger, comprising:
an aluminum alloy finstock comprised of about 0.7-1.2% Si, greater than 2.0 to about 2.4% Fe, about 0.6-1.0% Mn, up to about 0.5% Mg, up to about 2.5% Zn, up to about 0.10% Ti, and up to about 0.05% In, with the remainder comprising Al and tolerable impurities, wherein the aluminum alloy finstock is reduced by cold rolling into a fin for a heat exchanger that is substantially free of cracks.

11. (Original) The fin of claim 10 wherein said tolerable impurities comprise at least one of the following:
up to about 0.2% Cu, up to about 0.2% Zr, up to about 0.05% Cr and up to about 0.3% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.4%.

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12. (Original) The fin of claim 11 wherein said tolerable impurities are comprised of up to about 0.05% Cu, up to about 0.05% Zr, up to about 0.05% Cr and up to about 0.05% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.10%.

13. (Original) The fin of claim 11 wherein said aluminum alloy is comprised of about 0.8-1.1% Si, about 2.0-2.2% Fe, about 0.6-0.8% Mn, up to about 1.5% Zn, up to about 0.2% Mg, up to about 0.05% Ti, and up to about 0.03% In.

14. (Previously presented) A brazed aluminum heat exchanger comprising:
at least one tank structured to hold a coolant;
a header plate coupled to said at least one tank, said header plate including a plurality of apertures;
a plurality of substantially parallel fluid-carrying tubes each extending substantially perpendicular from one of said plurality of apertures in said header plate and structured to receive said coolant therethrough; and
a plurality of fins disposed between said plurality of fluid-carrying tubes, said fins being substantially free of cracks and in thermal communication with said plurality of fluid-carrying tubes and structured to transfer heat away therefrom, in order to cool said coolant as it circulates therein, said plurality of fins comprising:
an aluminum alloy finstock comprised of about 0.7-1.2% Si, greater than 2.0 to about 2.4% Fe, about 0.6-1.0% Mn, up to about 0.5% Mg, up to about 2.5% Zn, up to about 0.10% Ti, and up to about 0.05% In, with the remainder comprising Al and tolerable impurities.

15. (Original) The heat exchanger of claim 14 wherein said tolerable impurities comprise at least one of the following:
up to about 0.2% Cu, up to about 0.2% Zr, up to about 0.05% Cr and up to about 0.3% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.4%.

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16. (Original) The heat exchanger of claim 15 wherein said tolerable impurities are comprised of up to about 0.05% Cu, up to about 0.05% Zr, up to about 0.05% Cr and up to about 0.05% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.10%.

17. (Previously presented) The heat exchanger of claim 15 wherein said aluminum alloy is comprised of about 0.8-1.1 % Si, greater than 2.0 to about 2.2% Fe, about 0.6-0.8% Mn, up to about 1.5% Zn, up to about 0.2% Mg, up to about 0.05% Ti, and up to about 0.03% In.

18. (Withdrawn) A method of manufacturing aluminum alloy finstock from an alloy comprised of about 0.7-1.2% Si, about 1.9-2.4% Fe, about 0.6-1.0% Mn, up to about 0.5% Mg, up to about 2.5% Zn, up to about 0.10% Ti, up to about 0.05% In optionally, with the remainder comprising Al and tolerable impurities, the method comprising the steps of:

- providing a metal transfer system and a caster, said caster having a caster tip for strip casting said alloy;

- casting said alloy as a strip with a thickness of between about 2-10 mm by controlled continuous strip casting with an average cooling rate above about 300°C/sec. while substantially avoiding temperatures in said metal transfer system that would permit intermetallics to nucleate prior to exiting said caster tip and while substantially eliminating the formation of coarse eutectic center-line segregation;

- cold rolling said strip in at least one pass to a first intermediate annealing gauge of about 1-4mm;

- applying a first intermediate anneal to said strip for about 1-10 hours at a temperature of about 300-450°C;

- cold rolling said strip to a final intermediate anneal gauge of about 0.05-0.2mm;

- applying a final intermediate anneal to said strip for about 1-10

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hours at a temperature of about 300-450°C; and
cold rolling said strip to a final gauge using a reduction of
about 15-50%.

19. (Withdrawn) The method of claim 18 further including the step of applying a partial anneal of said final gauge, said partial anneal being for about 1-12 hours at a temperature of about 150-240°C.

20. (Withdrawn) The method of claim 18 further including the step of at least one additional intermediate anneal after at least about 70% cold reduction following said step of applying said first intermediate anneal and before said step of cold rolling said strip to said final intermediate anneal gauge, said at least one additional intermediate anneal being applied for between about 1-10 hours at a temperature of about 300-450°C.

21. (Withdrawn) The method of claim 20 further including the steps of applying said at least one additional intermediate anneal for about 1-6 hours at a temperature of about 330-400°C.

22. (Withdrawn) The method of claim 21 wherein said gauge of said strip at said additional intermediate anneal is sufficient to allow a subsequent cold reduction of at least 70% to said final intermediate gauge.

23. (Withdrawn) The method of claim 18 wherein the thickness of said strip cast by said step of casting said alloy as a strip, is about 5-9 mm.

24. (Withdrawn) The method of claim 18 wherein said steps of applying a first intermediate anneal and applying a second intermediate anneal are performed for about 1-6 hours at a temperature of between about 330-400°C.

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25. (Withdrawn) The method of claim 18 wherein said step of cold rolling said strip to a final gauge, uses a reduction of about 15-35%.

26. (Withdrawn) The method of claim 18 wherein said tolerable impurities within said finstock alloy comprise at least one of the following:
up to about 0.2% Cu, up to about 0.2% Zr, up to about 0.05% Cr and up to about 0.3% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.4%.

27. (Withdrawn) The method of claim 26 wherein said finstock is manufactured from an alloy which comprises about 0.8-1.1% Si, about 2.0-2.2% Fe, about 0.6-0.8% Mn, up to about 1.5% Zn, up to about 0.2% Mg, up to about 0.05% Ti, and up to about 0.03% In, with the remainder comprising Al and said tolerable impurities.

28. (Withdrawn) The method of claim 27 wherein said tolerable impurities are comprised of up to about 0.05% Cu, up to about 0.05% Zr, up to about 0.05% Cr and up to about 0.05% Ni, with the aggregate of all of said tolerable impurities not to exceed about 0.10%.